

GP-300793

RAPID STARTUP OF FUEL PROCESSOR
USING WATER ADSORPTION

ABSTRACT OF THE DISCLOSURE

An apparatus and method is disclosed for rapidly heating fuel processor components during startup of a fuel cell powered vehicle. Rapid heating is achieved by placing a water adsorbent downstream of the fuel processor's primary reactor, which converts a hydrocarbon-based fuel to a hydrogen-rich fuel. In addition to hydrogen, the reformed fuel (reformate) includes carbon dioxide, carbon monoxide and water. The water adsorbent, which has a high heat of adsorption, produces heat as it adsorbs water in the reformate. Heat generated by water adsorption enhances the rate at which fuel processor components, such as a water-gas-shift reactor, reach their operating temperatures. In addition, water adsorption reduces water condensation on the water-gas-shift reactor catalyst. Once the fuel processor components attain their operating temperatures, water desorbs from the adsorbent and is available for converting carbon monoxide to carbon dioxide and hydrogen in the water-gas-shift reactor.